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**Changing the Boiling Point of Water Lab**

**Purposes of the Lab**

* To identify the independent variable, dependent variable, and constants in an experiment.
* To practice graphing quantitative data.
* To determine how adding salt to water will affect the boiling point of water.

**Background**

Solutions are homogeneous mixtures of solute and solvent. The solvent is the most abundant substance in a solution. In a liquid solution, the solvent does the dissolving. The solute is the other substance in a solution. In a liquid solution, the solute is dissolved.

The boiling point of a substance is defined as the temperature at which a liquid becomes a gas. When a substance boils, the molecules gain enough energy to “break free” of the other molecules and escape as a gas.

**Materials**

* NaCl (non-iodized salt)
* Water
* Bunsen burner
* Thermometer
* Three 250-mL beakers
* Sharpie
* Weigh boat
* Ring stand apparatus

**Safety**

* Always wear safety goggles when working in the lab.
* Always be aware of an open flame. Do not reach over it. Tie back hair and secure lose clothing.
* Wash your hands thoroughly before leaving the lab.
* Clean up!

**Pre-Lab Questions**

*For questions 1-3, identify the independent variable, dependent variable, and 2 constants.*

1. An experiment was designed to investigate the effect of Kool-Aid on the behavior of 5-year-old children. Two populations of 5-year-old children were selected randomly. Both populations of children were placed in the same room (one group at a time) and asked to remain seated while they watched the same 20-minute video on airplanes. Researchers monitored the children’s behavior through 2-way mirrors. The children in population one each drank 8 ounces of cherry Kool-Aid 30 minutes prior to having their behavior monitored. The children in population two were given nothing to drink prior to the experiment.
2. Scientists observed that white mice that were fed seeds appeared to grow more than mice fed the regular diet of leafy green and yellow vegetables. The scientists hypothesized that the protein in the seed was responsible for the growth. They designed an experiment to test this hypothesis. They divided 200 mice of the same age, size, health, and sex into two groups of 100 mice each. The mice were kept under identical conditions for 90 days. One group was given the normal low protein diet. The other group was given new high protein diet. The mass of each mouse was recorded weekly for 90 days.
3. Betty Sue had a new pair of shoes. Betty Sue always seemed to ruin her shoes within two months. Betty Sue had heard of a new product called Scuff-B-Gone which was supposed to keep your shoes looking brand new for up to 6 months. Betty Sue decided to apply the Scuff-B-Gone to only the left shoe of her new shoes. She wore her new pair of shoes for two months. At the end of the two months, she compared the two shoes to see if the left shoe with Scuff-B-Gone looked any better than the right shoe without Scuff-B-Gone.
4. Identify the solute and solvent in this lab.
5. What happens to water molecules when they boil (transition from liquid to gas)?
6. Why are we doing this lab?
7. What is the independent variable in this lab? What is the dependent variable?

**Procedure**

1. Gather your materials.
2. Using your Sharpie, label 3 beakers with the following:
   * 0g salt
   * 10g salt
   * 20g salt
3. Transfer 100mL of pure water (0g salt) to the 250-mL beaker labeled “0g salt.”
4. Use your Bunsen burner to heat the substance until it comes to a rolling boil. Record the temperature of the solution every minute. Make sure that your thermometer does not touch the sides or bottom of the beaker.
5. Once your substance has boiled, you can pour it down the sink.
6. Repeat this procedure for the other two samples (10g and 20g of salt).
7. Begin post-lab questions.

**Data**

|  |  |  |  |
| --- | --- | --- | --- |
| Time (minutes) | Temperature of 0g Salt | Temperature of 10g Salt | Temperature of 20g Salt |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |
| 11 |  |  |  |
| 12 |  |  |  |
| 13 |  |  |  |
| 14 |  |  |  |
| 15 |  |  |  |
| 16 |  |  |  |
| 17 |  |  |  |
| 18 |  |  |  |
| 19 |  |  |  |

**Final Boiling Points**

* 0g Salt: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* 10g Salt: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* 20g Salt: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Graph**

Graph your data using a **line graph**. Include a title and label both axes.



**Conclusion**

What is the effect of adding salt on the boiling point of water? Use your data to answer this question in complete sentences. What is one possible error that may have affected your data?